



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
FOX et al.

Docket No.: 18760.023
Confirmation No. 7190

Serial No.: 09/887,653

Group Art Unit: 1755

Filed: June 22, 2001

Examiner: Faison, Veronica

For: AN INK FOR INKJET PRINTING THAT PRODUCES A DURABLE IMAGE

DECLARATION PER 37 C.F.R. §1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicants provide the following declaration evidence of Dr. James Fox, co-inventor of the above-identified application for the purpose of traversing the rejection of claims 10-12, 14-16 and 21 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,512,089 (Thakkar) and the rejection of claims 1-7, 10-16, and 24-26 under 35 U.S.C. §103(a) as being unpatentable over EP 1 114 850 as set forth in the Office Action of record. The declaration supports the patentability of the claims.

I, James Fox, am co-inventor of present Application Serial No. 09/887,653 as shown by the signed oath of record in this case. I have obtained the degree of Bachelor of Science in Chemistry and Polymer Science from Loughborough University in the year 1995, and the degree of PhD in Chemistry; thesis title "Nano-Dispersion Technology for Inkjet Printing" from Manchester University in the year 2004. I have been employed in the field of inkjet printing for over ten years, initially for Domino Printing Sciences which is a continuous inkjet printer and ink manufacturer,

and for the last 8 years for Xennia Technology which is a research and development company specializing in the field of inkjet fluid development. I started in inkjet printing at laboratory bench level as an Inkjet Chemist and am currently the Research & Development Director of Xennia Technology.

I declare the following:

From my experience in the field of inkjet printing, a need exists in the industry for an ink formulation that is suitable for drop on demand inkjet printing that provides good humectancy in addition to good wetfastness. Our invention unexpectedly meets this need.

In summary, our invention relates to the use of polypropylene glycol (PPG) in pigment based inkjet inks for drop on demand inkjet print heads to provide acceptable dwell time, whilst at the same time not compromising the wet fastness of the final printed image. It is preferred to use the minimum amount of PPG that will give an acceptable dwell time, so as to minimize the viscosity of the ink and, therefore, maximize the allowable concentration of functional material that can be incorporated into the ink. It was determined that this desired amount of PPG may be expressed as a ratio of pigment to PPG.

To achieve an acceptable dwell time, humectants are incorporated into inkjet inks. These materials have a high affinity for water and thereby limit its evaporation from an idle nozzle and so increase dwell (idle) time. As these materials have a high affinity for water, they are usually expected to reduce the wetfastness of a printed image. It was therefore a surprising result to find that PPG whilst having a powerful humectant effect did not reduce the wetfastness of the printed image. It was also surprising to find that PPG at such low concentrations (relative to the pigment concentration) could continue to exhibit an acceptable humectant effect.

I have read the Office Action in which the claims of our invention are rejected and have read the references which are the basis for the rejections, namely EP 1 114 850 A1 and U.S. Patent No. 5,512,089.

The examples of EP 1 114 850 A1 specifically referred to by the Examiner are Comparative Example W3 and Comparative Example W4. On page 10, paragraph 75, EP 1 114 850 A1 describes these two formulations as unsuitable for inkjet printing as they "could not be stably ejected [from the print head] due to their high viscosity." In contrast, the formulation of our invention is suitable for inkjet printing. The formulation of Comparative Example W3 describes a low pigment to PPG ratio. However, if this ink was to be printable, the presence of such a high concentration of glycerin would override the PPG effect and the wet fastness would be poor. Indeed, using other humectants in combination with PPG is unnecessary and undesirable as these will reduce the wetfastness of the final printed image.

It would therefore not be obvious to start with non-functioning ink formulations and attempt to modify them to make them suitable for inkjet printing, especially when many functioning formulations are listed and no wetfastness benefit is described or would be expected from the non-functioning formulations. Furthermore, the other humectant (glycerin) included in these formulations would compromise the wetfastness and so the benefit of the use of PPG would not be realized even if the formulations were modified so as to be functional.

With respect to U.S. Patent No. 5,512,089, the invention described therein is specific to continuous inkjet (CIJ) printing, whereas our invention is concerned with drop on demand (DOD) inkjet printing. These are two different inkjet technologies and as such have different complexities associated with their ink design.

Continuous inkjet (CIJ) printing, as the name implies, forms a jet of droplets all of the time that the printer is active and ready to print. The drops to be printed are then selected by charging them, which causes them to be deflected from the continuous droplet stream, and the remaining unprinted drops are recycled. In drop on demand (DOD) inkjet printing, droplets are only produced from the nozzle by a pressure pulse when required and so the nozzle may experience long idle (dwell) periods between droplet ejections. During these idle periods, water will evaporate from the nozzle and a humectant is required to reduce the rate of evaporation and maintain the ink as a liquid in the nozzle, preventing clogging of the nozzle with dried ink.

Our invention unexpectedly improves dwell performance in DOD inkjet printing, whilst also providing good wetfastness of the printed image. For the CIJ printing technique employed by U.S. Patent No. 5,512,089, dwell performance is not relevant as the jet is continuously present during printing. Furthermore, the issue of re-dispersibility with which U.S. Patent No. 5,512,089 is concerned is not relevant to DOD inkjet printing. It would therefore not be obvious to take a CIJ ink and use this in a DOD printer, as it would be expected that the ink would have poor dwell performance in the DOD printer due to the low level of humectant used, as well as the incorporation of materials for re-dispersability unnecessarily compromising the wetfastness of the printed image.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Signed

James Fox

Printed Name

JAMES FOX

Date

17/08/05